BUILDING THE IOWA INDUSTRIAL REFORMATORY

BY

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ARMOUR INSTITUTE OF TECHNOLOGY

1917

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 Reformatory for Females

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BUILDING THE IOWA INDUSTRIAL REFORMATORY FOR FEMALES

A THESIS

PRESENTED BY

JENS A. HOLMBOE

TO THE

PRESIDENT AND FACULTY

OF

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CIVIL ENGINEER

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PREFACE.

It is my aim in the following thesis to give an account of our method of building the Iowa Industrial Reformatory For Females, located about one and one-half miles East of Rockwell City, Iowa. As these buildings were already designed, both as to size and strength, it is not my intention to cover these points. It is my aim to give an account of our organization, the machinery and equipment we used, and our methods of construction. The cost of doing work satisfactorily is now one of the chief factors in construction and engineering work, and I am therefore giving an account of our methods of doing work in an economical manner.

LOCATION.

The site of the Reformatory is located about one and one-half miles East of Rockwell City, Iowa. Our contract called for the erection of four buildings, Administration Building, Pathology Building, Typical Cottage, Power House, and a reinforced concrete service tunnel, about thirteen hundred feet long, connecting the Power House with the above mentioned buildings. The plans were prepared by Proudfoot, Bird and Rawson of Des Moines, Iowa, and the Bailey-Marsh Company of Minneapolis were the general contractors. Our first carload of equipment arrived in Rockwell City, Iowa, about the middle of August 1916 and we started excavating at once.

WATER SUPPLY.

Aside from the usual problems encountered in the construction of fireproof buildings, we had the additional problem of supplying water to the job and the hauling of material about a half mile. We found on arriving on the job, that the State had already sunk a seven inch casing to a depth of one hundred and twenty-five feet below the surface of the ground, the well being located near the Power House. Inside of this casing we lowered a 1½" pipe to a depth of one one hundred and eight feet, and placed a pump head directly over the top and attached by a belt a Fairbanks Morse Type "Z" 1½ H.P. gas engine.

The Power House was located on a spot of ground fifteen feet lower than the other buildings. It is always necessary to have a supply of water on hand in case the pump breaks down, and we therefore erected a water tank on a high spot of ground, situated along the concrete Service Tunnel. This tank was eight feet in diameter and eight feet high, and was placed on a trestle twenty-four feet high. From the well we laid an inch and a half pipe line along the tunnel and up

into the tank and from the tank to the other three buildings. At points about a hundred feet apart on this pipe line we placed a 1½" to 1" Tee along the tunnel so that we could get water for the concrete very easily by simply connecting a fifty foot hose to the water line. As a final precaution we lowered the pipe line four and a half feet below the surface of the ground to keep same from freezing, and placed a system of valves so that we could drain the pipe line at night if desired. By keeping the tank full of water at all times [illegible] were able to keep the bottom of the tank from freezing. The water in the tank rarely froze more than four or five inches on the top. The actual cost of lowering this pipe line in the ground and backfilling the ditch with dirt was about four cents per lineal foot. The entire water system, including the cost of the pipe, gas engine, pump head and tank and the labor of installing was placed at three hundred dollars and proved to be quite successful. About the only improvements we would suggest at this time would be to use a three horse power gas en-

gine. The load often proved to be so very heavy that the gas engine stopped and this required considerable attention, which is quite costly.

HAULING.

Our next problem was to get our material hauled as cheaply as possible. The Ft. D. D. M. & S. Ry., an electric line, placed a spur from their track about two thousand feet from the job and later continued this track to the Power House. They did not place their electric cable, however, until the job was about completed. They switched the cars of material on to the spur and left them for us to pull down to the Power House. This was during the fall of 1916 when there was a great car shortage; consequently the cars were loaded to the limit of their capacity. It would not have paid to unload this material at a distance so far from the work, so it was necessary for us to pull the cars down to the Power House with teams, and often on account of the poor condition of the care, we were compelled to use block and tackle. When this was necessary, we used a three hundred foot cable and two single blocks, and pulled the cars down with the team of horses. One block was attached to the car and the free block we fastened to the rail about one hundred and forty feet ahead of the car.

We then laid a narrow gauge industry track along the side of the Ft. D.D.M. & S. track, which ran past the Power House, along the Service Tunnel, and past the other three buildings. In this manner we were able to unload material out of the cars directly into our dump cars, and haul this material to any part of the job. We had ten dump cars, each holding about 1¼ yards of sand and five flat cars. A team of horses could pull a train of four cars nicely, if there was not too much of a grade. We found that it was a great advantage in unloading the dump cars, to have the track elevated about 2½ feet above the ground, where the material is to be unloaded. A good method of elevating this track is to crib up with old planks and 4" x 4" lumber.

The cost of laying three thousand feet of this track was about $100.00 or 3-1/3¢ per foot. This includes the cost of switches and spiking down the ties. The first time we laid this tract we used 4"x4" ties about 2½' long and spaced the ties about 3' centers. This was not successful however. Where the ground was

soft, such as thru the corn field, the cars would often tip over, due to one end of the tie sinking in the soft ground. We then bought 3" x 6" ties about 4'-0" long, and found that they are very satisfactory.

With our equipment we found that the best method of handling the work, was to have four cars being loaded, four cars being unloaded, and four cars being hauled on the track. In this way the team brings four cars of material to the jog and leaves them to be unloaded, returning to the main track with four empty cars. At the tract there are four cars of material loaded and ready to be pulled out and the four empty cars are left to be loaded.

Below is a list of the cost of hauling material two thousand feet. It does not include the cost of loading or unloading, and is based on one team at $ .50 per hour.

Hauling brick (common)	$	.10	per	M
Hauling Wall Tile (5x8x12)		.60	"	"
Hauling cement (Sacks)		.05	"	Ton.
Hauling Sand & Gravel		.06	"	Yd.
Hauling Lumber (Flat Cars)		.10	"	M.B.M.

TUNNEL.

After getting the buildings located, the next problem was the building of a concrete Service Tunnel, constructed as shown on the blue print. This tunnel was for the purpose of enclosing the service pipes from the buildings to the Power House and was about fourteen hundred feet long. The exeavation from the surface of the ground to the bottom of the tunnel varied from a depth of ten to twenty feet.

Our equipment was placed as follows: The water pipe was run parallel to the tunnel, about twenty-five feet from the center line. The industry track was also parallel to the tunnel and at a distance of thirty feet from the center line. A light concrete mixer was placed about five feet from the edge of the tunnel. The mixer was run by a gas engine and was light enough to be pushed around by four men. The excavation was managed by a steam shovel of the drag-line type, having a sixty foot boom.

The tunnel was excavated to the exact depth and the earth walls were excavated and trimmed to the exact width, so that no outside concrete forms were necessary.

A line of 6" drain tile was laid in the center of the floor and this served to keep the excavation free from water, and thus kept the earth walls from caving in.

The first operation was to place eighty lineal feet of the concrete floor. The reinforcing steel was then placed and the wall and top forms set, and the concrete placed. The concrete was all spouted, andaabout five or six men were all that were necessary to place enough concrete to make thirty or forty feet of tunnel. The sand and gravel for the concrete was hauled on the industry track and dumped just back of the mixer. The problem consisted in making a certain amount of progress each day. We had sixty lineal feet of forms and it was necessary to let the concrete set for two days, we made a practice of pouring thirty feet of tunnel every day. Also we always placed sixty feet of concrete floor ahead of the tunnel, so that it would have two days to set before being worked on. In this manner we had very little trouble, with the exception of the banks caving in now and then. When the weather was alternately cold and warm, the banks often sloughed off, and it was sometimes necessary to shore up the walls.

WINTER WORK.

In order to complete the job on tile, it was necessary to work during the winter as much as possible. The brickwork was not much of a problem, as the buildings were all made of hollow blocks, with white cement stucco on the outside. During the cold weather, we slaked the lime in the mortar box, heated the water and sand, and used salamanders on the mortar boards to keep the mortar hot. A little extra cement was used in the mortar to make it set before freezing. In this way we worked in weather as cold as five degrees below zero.

In placing the concrete foundation walls, which were thirteen inches thick, and below the surface of the ground, we took the following precautions. We first heated the pile of sand and gravel, by means of a steam hose attached to the boiler of the concrete mixer. After the sand was well heated, we turned the steam into the water, and then started to mix the concrete. In this way the sand, gravel and water were hot, and this made the concrete warm when it was placed in the forms, and would thus set before freezing. The only other precautions taken were to keep the snow and ice off the

top of the walls and keep the sun off the concrete until it was well dried out. We found that if the concrete once had set before freezing and was not allowed to alternately thaw and freeze, we had no trouble. I would not, however, assert that this is safe practice. As little water as possible is used in cold weather. In reinforced work such as hollow tile floor construction, the added precaution of placing coke fires in salamanders below the floor should be taken, and the slab covered with a foot and a half of straw. If the weather is very cold it is good practice to keep the coke fires going for a period of three or four days.

The most dangerous action of all is the heaving action of the frost, and it is almost impossible to tell just what it will do. There was a concrete ash conveyer tunnel running in front of the boilers in the Power House, the walls being ten feet high and twelve inches thick. The top slab was reinforced both ways but there was no steel in the side walls.

The frost in the ground caused the frozen earth to expand with such force that it cracked the concrete walls the entire length of the tunnel, in a line parallel with the top, and about four feet from the ground. There was nothing to do but brace the walls from the inside and wait for spring, and jack the walls back into place. We also placed another protection wall on the outside. The buildings usually heave about one or two inches in the winter, and if there is any great variation in the weights of the different parts of the building, there is almost sure to be cracks in the walls. One precaution is to keep the basement well enclosed, so as to keep the ground from freezing as much as possible.

Winter work is a great deal more expensive than summer work. The cost of labor of doing brickwork in the winter will average fifteen per cent higher than doing the same work in the summer, and the placing of concrete will easily run thirty per cent higher.

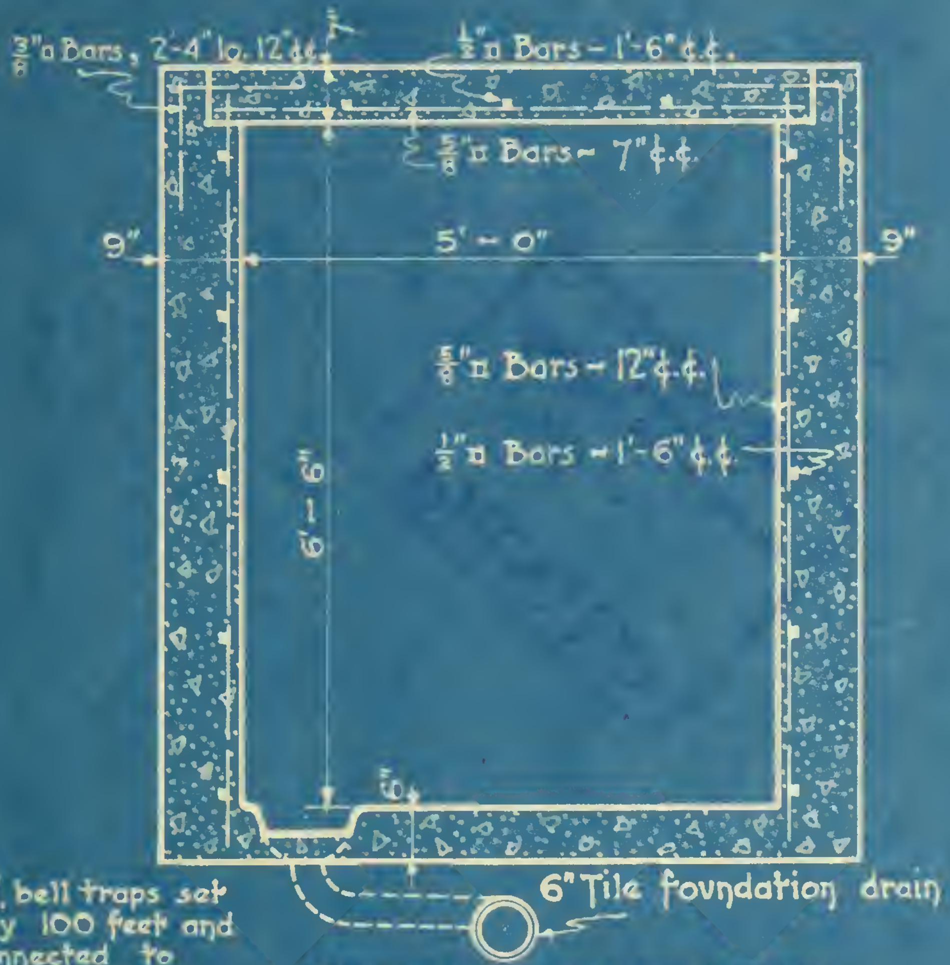
A great deal of care must be taken of the gas engine, as it is necessary to drain them every night, otherwise the water jackets will freeze and crack the machines. The only great advantage of winter work, is the fact that it is possible to get plenty of labor at a reasonable price, and with the present scarcity of labor this is a big item.

BOARDING CAMP.

As the job was situated out in the country about a mile and a half from Rockwell City, it was thought wise to run a boarding camp for the men. The Kitchen and Dining Room, the Bunk House and the Office. The construction of the buildings consisted of 2 x 4 studs and rafters, 2 x 6 floor joists and 1 x 8 shiplap for the face boards. The roof we covered with rubberoid roofing paper, and the walls with tar paper. One building was divided into a kitchen, two dining rooms, one provision room and one bedroom for the cook and his help. The Bunk House was divided into two parts, one for the mechanics and one for the laborers. These two large rooms were again partitioner off into rooms accommodating four men each. The total cost of the camp was about five hundred dollars and it housed about fifty two men.

There are advantages and disadvantages in a boarding camp. By charging the laborers six dollars a week, the mechanics seven dollars, the camp just about paid for itself. Thus as far as the financial end is concerned, there is very little profit in running a boarding camp for less than one year.

There is the great advantage, however, of always having the men on the job, and where the job is out in the country or near a small town, it is hard to realize how important this is. There is a class of labor that has no home, and during the winter when work is scarce, they are always glad to find a good boarding camp. In this way there is always a good c crew of men on the job, ready to go to work at a moments notice, whenever necessary. Therefore on the whole if the camp merely pays for itself it is a decided advantage to a building out in the country. The chief point to bear in mind, is to have plenty of light and ventilation.



9"x9" bell traps set every 100 feet and connected to foundation drain.

·SECTION·THRU·PIPE·TUNNEL·

·Scale: 1/2" = 1'-0"·

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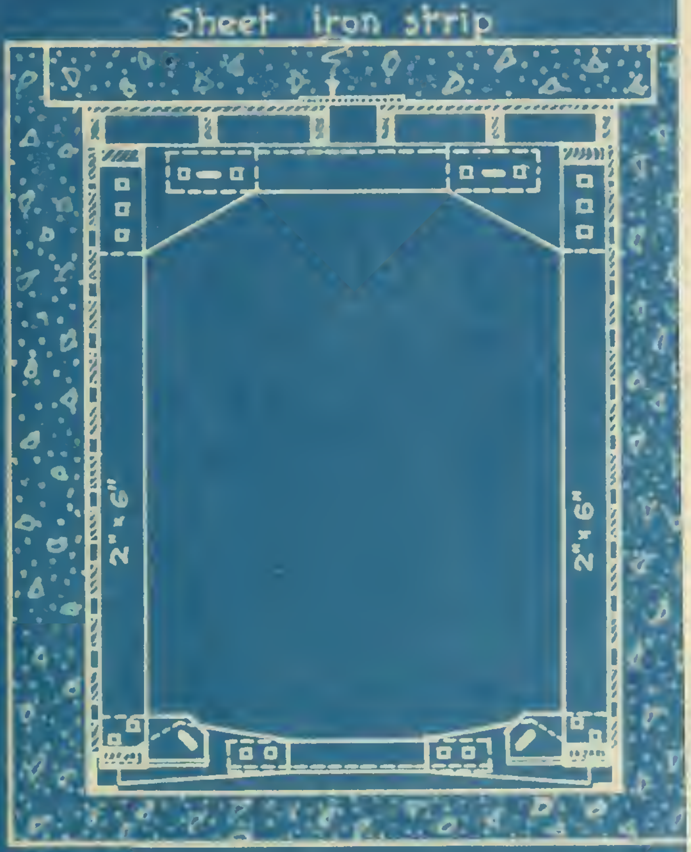

· CROSS · SECTION ·
Scale: ½"=1'-0"

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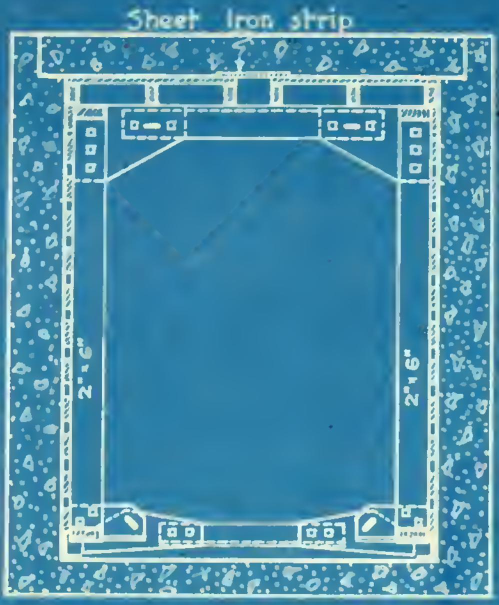
·ERECTION · PLAN · OF · FORMS · FOR · TUNNEL·



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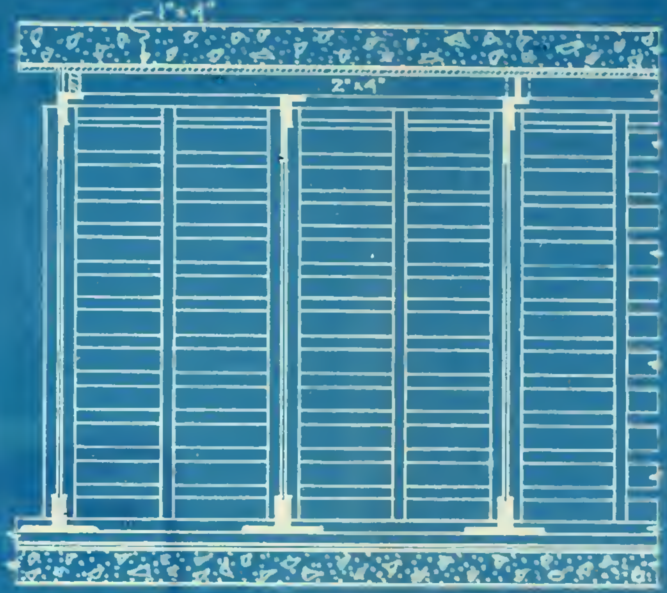

·LONGITUDINAL · SECTION·
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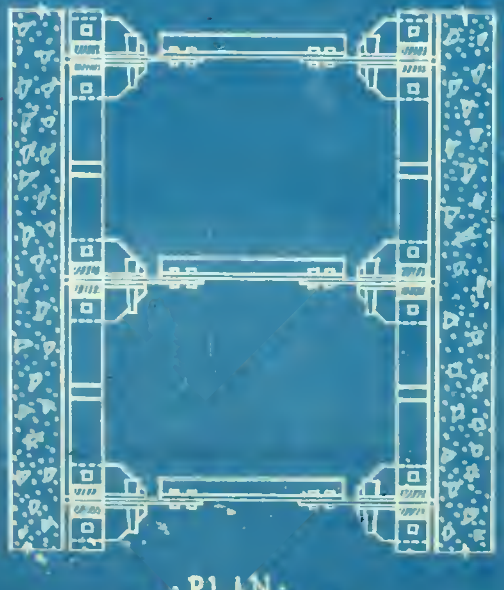

·PLAN·
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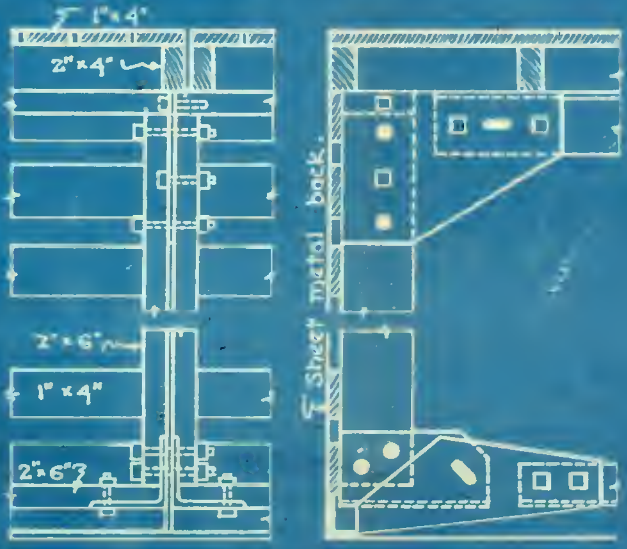

·DETAIL·
·Scale: 1" = 1'-0" ·

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LAYOUT OF BUILDINGS
·IOWA·INDUSTRIAL·REFORMATORY·FOR·FEMALES·

SCALE 1" = 100'.